

EPA Response to the Associated Earth Sciences, Inc. Technical Memorandum dated 2/12/13
Re: Technical Review of Pacific Groundwater Group Hydrogeologic Evaluation of Proposed
Leque Island Restoration Report

EPA has reviewed the comments provided by Associated Earth Sciences, Inc on the hydrogeologic evaluation study done by the Pacific Groundwater Group (PGG). Questions on well logs and the accuracy of both water levels and salinity data need to be directed to PGG

A summary of Associated Earth Sciences key comments and EPA's responses are below.

1. Comment: The PGG study scope was limited and did not include site specific data and was not based on regional data.

Response: Site specific data would improve model accuracy. EPA would suggest that JBWA provide its data to Fish and Wildlife. Additional model runs can be carried with the site specific data for refinement, which could assist with design of specific management actions. However, more precise site specific data are not likely to change the predicted direction of groundwater flow from Camano Island towards Leque and that the ditched Camano Island lowland (monitoring site) is a discharge area.

2. Comment: Request that a new study be developed using additional site specific information and water use information already developed by others.

Response: EPA does not believe that a new study is needed in order to make its determination regarding the impact of the salmon restoration project. However, EPA does believe that Island County would benefit from additional studies regarding the potential for salt water intrusion as a result of several factors including additional pumping to meet future growth.

3. Comment: Request that EPA require WDFW to complete a detailed hydrogeologic evaluation of Leque Island and the northeastern portion of Camano Island to address these concerns.

Response: This has been addressed through uncertainty analysis. If a detailed hydrogeologic evaluation of Leque Island was completed, it is still highly unlikely that PGG findings would be altered.

4. Comment: PGG did not account for single-residential well domestic use due to the assumption that "pumping on the island is assumed to be largely non-consumptive due to septic effluent returns."

Response: EPA agrees that the assumption "pumping on the island is assumed to be largely non-consumptive due to septic effluent returns" might be dubious and the annual average 9 gpm withdrawal from a single well might be lower than actual annual rates. Additional model runs with increasingly more accurate pumping withdrawals can be carried to further refine risk analysis and project design scenarios. However, EPA does not believe that moderate adjustments to these input parameters would change the overall direction of groundwater flow.

5. Comment: The PGG report states "the 3D model was run in steady-state mode, and therefore does not simulate seasonal variations." The report also states that "the largest relative rise in Leque Island

groundwater levels will occur in the summer months...and the largest rise in groundwater levels will occur on Leque Island.”

Response: The model simulates annually averaged flow conditions and the concern about seasonal effects is legitimate if pumping takes place in close proximity to Leque Island during the period roughly mid April through September. On annual average, model results indicate no flow reversal at east Camano Island, except that from Leque Island towards ditched Camano Island lowland. Therefore, threat of salt water intrusion is unlikely. PGG provided additional model runs which demonstrated highly conservative drought conditions of pumping and precipitation recharge under which groundwater flow under Camano Island uplands is reversed. The groundwater flow reversal was predicted under highly unlikely drought conditions and pumping rates.

6. Comment: Under the restored condition, 365 in/yr of recharge of brackish water due to tidal inundation may increase groundwater salinity, especially if the purported high drainage efficiency of newly formed channels does not materialize.

Response: This may be true, but the magnitude of groundwater salinity is irrelevant to the issue of groundwater flow directions.

7. Comment: Only one very short term (15 minute), low rate pumping test (1.8 gpm) was conducted in one of the eight monitoring wells. This amount of aquifer testing is inadequate to characterize the aquifer conductivity in the monitoring area.

Response: More and longer pump test analysis could have been conducted as opposed to the single and short duration pump test carried in this study to increase accuracy. However, model calibration using accurately measured water levels and inferences from soil texture is a valid approach to estimate unknown parameters. Certainly, the use of pump-test inferred hydraulic conductivity values would have minimized model uncertainty. Aquifer properties estimated by pump tests will improve model calibration locally, but EPA does not expect that the incremental gains to alter conclusions about flow directions.